

claims 4 and 11 under 35 U.S.C. §103(a) as being unpatentable over Scifres et al. and rejected claims 7 and 14 under 35 U.S.C. §103(a) as being unpatentable over Scifres et al. (United States Patent No. 4,820,010) in view of Rope et al. (United States Patent No. 6,252,715).

The present invention is directed to a method and apparatus for coupling a multimode laser to a multimode fiber using a multimode tapered structure. The disclosed multimode tapered structure accepts an optical beam having a highly elliptical beam shape and converts the optical beam for acceptance by the circular multimode optical fiber. According to one aspect of the invention, the multimode tapered structure has a tapered form having an elliptical cross section at one end to match the rectangular laser aperture, and a circular cross section at the other end to match the fiber core.

Independent Claims 1, 8, 15 and 16

Independent claims 1, 8, and 15 were rejected under 35 U.S.C. §102(b) as being unpatentable over Scifres et al. The Examiner asserts that Scifres shows in Figure 1-4, 8, and 11 a multimode tapered structure (Fig. 2: 17) for coupling a multimode laser (Fig. 2: 11, 45) to a multimode fiber (Fig. 2: 53; Fig. 4: 27, 33). Applicants note, however, that Scifres is directed to fiber optic waveguides wherein the “input end of the fiber optic waveguides may be squashed into an elongated cross section.” See, Abstract. Scifres teaches that the light from a laser is then directed to the fiber optic waveguide *without an intervening structure*. The independent claims of the present invention, alternatively, are directed to a “multimode tapered structure” that couples a “multimode laser to a multimode fiber.” As set forth in each of the independent claims, the multimode tapered structure must have an “input end having an elliptical cross section for coupling with said multimode laser” and an “output end having a circular cross section for coupling with said multimode fiber.” The structure described in Scifres does not have an output end that couples with a fiber, since the structure is a squashed fiber itself!

With the multimode tapered structure of the present invention, the light passes from the laser through the claimed tapered structure to the fiber optic cable. The multimode tapered structure is not optically equivalent to a fiber optic waveguide that has been squashed. In particular, the fiber optic waveguide of Scifres does not have an “output end having a circular cross section for coupling with said multimode fiber,” as required by independent claims 1, 8, 15, and 16.

Rope et al. was also cited by the Examiner in rejecting claims 7 and 14 for its disclosure that a beam pattern is often elliptical and its disclosure of a focus element where elliptical beams are converted to circular beams for output. Applicant notes that Rope et al. is directed to an “optical head assembly, method, and procedure which generates and then precisely positions multiple light beams onto a target.” See, Abstract. Rope does not address coupling a multimode laser to a multimode fiber and does not address multimode tapered structures, as required by independent claims 1, 8, 15, and 16.

Dependent Claims 2-7 and 9-14

Dependent claims 4 and 11 were rejected under 35 U.S.C. §103(a) as being unpatentable over Scifres et al. and dependent claims 7 and 14 were rejected under 35 U.S.C. §103(a) as being unpatentable over Scifres et al. in view of Rope et al. Applicants note that dependent claims 2-3, 5-6, 9-10, and 12-13 were not formally rejected by the Examiner, although the Examiner does address these claims in regard to the Scifres reference.

Claims 2-7 and 9-14 are dependent on Claims 1 and 8, respectively, and are therefore patentably distinguished over Scifres and Rope (alone or in any combination) because of their dependency from amended independent Claims 1 and 8 for the reasons set forth above, as well as other elements these claims add in combination to their base claim.

All of the pending claims, i.e., claims 1 through 16, are in condition for allowance and such favorable action is earnestly solicited.

If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this application, the Examiner is invited to contact the undersigned at the telephone number indicated below.

The Examiner's attention to this matter is appreciated.

Respectfully submitted,

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Date: May 28, 2003

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